first structural layer 204 in Figure 2, with each copy having the same position and orientation as the first. Here, the result is a one-dimensional dielectric mirror which could in no other manner be so perfectly integrated into, e.g., an integrated optic circuit on a chip. Such non-vertically directed structures have great potential for use in integrated optics and optoelectronic devices. --

In the Claims

Please cancel Claims 1-43.

Please amend Claims 44-51 as follows:

44. (Amended) A layered material composition for a photonic or phononic lattice made [using the method of Claim 1] by a process comprising steps for:

(a) forming, upon an upper surface of a substructure, a structured layer having a top surface and a substantially planar bottom surface;

(b) planarizing the top surface of the structured layer by chemical-mechanical polishing; and

(c) repeating steps a and b to form the layered material composition wherein optical or acoustical properties spatially vary in two or three dimensions, and wherein the planarized top surface of a given layer forms the upper surface of the substructure upon which the next structured layer is to be grown.

45. (Amended) A layered material composition for a photonic or phononic lattice made [using the method of Claim 17] by a process comprising steps for:

(a) forming, upon an upper surface of a substructure, a structured layer having substantially coplanar top and bottom surfaces and further comprising a configuration of tiles wherein each tile is substantially identical to some reference tile chosen from a group of reference tiles, by:

(i) depositing a first film of a first material upon the upper surface;

(ii) defining a pattern upon the first film;

(iii) patterning the first film according to the pattern;

(iv) depositing, atop the patterned first film, a second film of a second material; and

(v) planarizing the top surface of the structured layer by chemical-mechanical polishing; and

(b) repeating the steps in (a) to form the layered material composition, wherein the planarized top surface of a given layer forms the upper surface of the substructure upon which the next structured layer is to be grown, and wherein the material of at least one structured layer has spatially varying physical properties.

46. (Amended) A layered material composition for a photonic or phononic lattice made [using the method of Claim 31] by a process comprising steps for:

(a) forming, upon an upper surface of a substructure, a structured layer having a top surface and a substantially planar bottom surface by a fillet procedure further comprising steps for:

(i) patterning a fillet definition structure comprising fillet defining features; and

(ii) overcoating the fillet definition structure with a protofillet layer;

(b) planarizing the top surface of the structured layer by chemical-mechanical polishing; and

(c) repeating steps a and b to form the layered material composition, wherein the planarized top surface of a given layer forms the upper surface of the substructure upon which the next structured layer is to be grown, and wherein the material of at least one structured layer has spatially varying physical properties.

47. (Amended) A layered material composition for a photonic or phononic lattice made [using the method of Claim 40] by a process comprising steps for:

(a) forming, upon an upper surface of a substructure, a structured layer having a top surface and a substantially planar bottom surface by a fillet procedure further comprising steps for:

(i) patterning a fillet definition structure comprising fillet defining features;

(ii) overcoating the fillet definition structure with a protofillet layer;

(iii) removing part of the fillet definition structure and thereby generating isolated fillet structures;

(iv) filling in the spaces between the isolated fillet structures to a depth at least equal to a design height of the isolated fillet structures; and

(v) planarizing the top surface of the structured layer by chemical-mechanical polishing; and

(b) repeating the steps in (a) to form the layered material composition, wherein the planarized top surface of a given layer forms the upper surface of the substructure upon which the next structured layer is to be grown, and wherein the material of at least one structured layer has spatially varying physical properties.

48. (Amended) An apparatus comprising a photonic or phononic lattice [layered material composition made using the method of Claim 1] further comprising:

(a) a substructure with an upper surface; and

(b) a plurality of structured layers formed on the upper surface of the substructure, with each structured layer having a top surface planarized by chemical-mechanical polishing, and with the top surface of all but one structured layer forming the upper surface upon which the next structured layer is grown.

A cont.

49. (Amended) An apparatus comprising a photonic or phononic lattice [layered material composition made using the method of Claim 17] further comprising:

(a) a substructure having an upper surface; and

(b) a plurality of structured layers formed on the upper surface of the substructure, with each structured layer comprising:

(i) a deposited and patterned first film of a first material;

(ii) a deposited and patterned second film of a second material formed atop the first film; and

(iii) a top surface planarized by chemical-mechanical polishing.

50. (Amended) An apparatus comprising a photonic or phononic lattice [layered material composition made using the method of Claim 31] further comprising:

(a) a substructure having an upper surface; and

(b) a plurality of structured layers formed on the upper surface of the substructure, with each structured layer comprising:

(i) a top surface planarized by chemical-mechanical polishing; and

(ii) a substantially planar bottom surface;

and with at least one of the plurality of structured layers being formed using a patterned fillet definition structure and a protofillet layer overcoated on the fillet definition structure to provide spatially varying physical properties within that structured layer.

51. (Amended) An apparatus comprising a photonic or phononic lattice [layered material composition made using the method of Claim 40] further comprising:

(a) a substructure having an upper surface; and

(b) a plurality of structured layers formed on the upper surface of the substructure, with each structured layer comprising:

(i) a top surface planarized by chemical-mechanical polishing; and

(ii) a substantially planar bottom surface;

and with at least one of the plurality of structured layers further comprising a plurality of isolated fillet structures formed from a protofillet layer overcoated on a patterned fillet definition structure, with spaces between the isolated fillet structures in that structured layer being completely filled in by a deposited material, thereby providing spatially varying physical properties for that structured layer.

Please enter new Claims 52-83 as follows:

A4

52. (New) A photonic or phononic lattice structure, comprising:

(a) a first plurality of rods formed on a substrate from a first material and being arranged parallel to each other, with spaces between the rods in the first plurality of rods comprising a second material;

(b) a second plurality of rods formed above the first plurality of rods from the first material, with spaces between the rods in the second plurality of rods comprising the second material, and with the second plurality of rods being arranged parallel to each other and rotated by an angle of 60° or 120° with respect to the first plurality of rods; and

(c) a third plurality of rods formed above the second plurality of rods from the first material, with spaces between the rods in the third plurality of rods comprising the second material, and with the third plurality of rods being arranged parallel to each other and further being rotated in the same direction and by the same angle of 60° or 120° with respect to the second plurality of rods.

53. (New) The structure of Claim 52 wherein the first and second materials are selected from the group consisting of polycrystalline silicon, amorphous silicon, silicon nitride, silicon dioxide, silicate glasses, III-V semiconductors, II-VI semiconductors, II-IV semiconductors, transparent oxides, sol-gel glasses and spin-on glasses.

54. (New) The structure of Claim 53 wherein a third material is substituted for the first or second materials after formation of the first, second and third plurality of rods.

55. (New) The structure of Claim 52 wherein first, second and third plurality of rods forms a periodic structure having a bandgap therein.

56. (New) The structure of Claim 52 wherein a thickness of the rods in one of the first, second and third plurality of rods differs from the thickness of the rods in another of the first, second and third plurality of rods.

57. (New) The structure of Claim 52 wherein a size of the rods in one of the first, second and third plurality of rods differs from the size of the rods in another of the first, second and third plurality of rods.

58. (New) The structure of Claim 52 wherein a spacing of the rods in one of the first, second and third plurality of rods differs from the spacing of the rods in another of the first, second and third plurality of rods.

59. (New) The structure of Claim 52 wherein a size of the rods in each of the first, second and third plurality of rods is the same.

60. (New) The structure of Claim 52 wherein a spacing between adjacent rods within a structured layer formed from each of the first, second and third plurality of rods is the same.

61. (New) A photonic or phononic lattice structure, comprising:

(a) a plurality of honeycomb layers stacked one above the other, with each honeycomb layer being formed by depositing and patterning layers of a first material to form a continuous hexagonal structure with voids in the continuous hexagonal structure comprising the second material, and with adjacent layers of the plurality of honeycomb layers being laterally displaced relative to each other along a diagonal of the hexagonal structure;

(b) an interconnection layer sandwiched between each pair of adjacent honeycomb layers for interconnecting the adjacent honeycomb layers at vertices of the hexagonal structure, with the interconnection layer being formed by depositing and patterning layers of the first material to form dots wherein the vertices are interconnected, and with the remainder of the interconnection layer comprising the second material.

62. (New) The photonic or phononic lattice structure of Claim 61 wherein the first and second materials are selected from the group consisting of polycrystalline silicon, amorphous silicon, silicon nitride, silicon dioxide, silicate glasses, III-V semiconductors, II-VI semiconductors, II-IV semiconductors, transparent oxides, sol-gel glasses and spin-on glasses.

63. (New) The structure of Claim 62 wherein a third material is substituted for the second material after formation of the plurality of honeycomb layers and each interconnection layer.

64. (New) The structure of Clam 62 further comprising a substrate whereon the each honeycomb layer and interconnection layer are supported.

65. (New) The structure of Claim 62 wherein the continuous hexagonal structure comprises a plurality of interconnected rods, and the thickness of each honeycomb layer is equal to one-quarter of the length of one of the rods.

66. (New) The structure of Claim 65 wherein the dots are circular in the plane of the interconnection layer.

67. (New) The structure of Claim 66 wherein the circular dots have a diameter substantially equal to one-half the length of one of the rods.

68. (New) The structure of Claim 62 wherein the thickness of each interconnection layer is twice the thickness of each honeycomb layer.

69. (New) The structure of Claim 62 wherein the plurality of honeycomb layers forms a periodic structure having a bandgap therein.

70. (New) A photonic or phononic lattice structure comprising a plurality of honeycomb layers formed from interconnected rods arranged in a continuous hexagonal structure, with adjacent honeycomb layers being laterally shifted along a diagonal of the hexagonal structure relative to each other and being connected together through an intervening layer.

71. (New) The structure of Claim 70 wherein the plurality of honeycomb layers forms a periodic structure having a bandgap therein.

72. (New) The structure of Claim 70 wherein each rod comprises a material selected from the group consisting of polycrystalline silicon, amorphous silicon, silicon nitride, silicon dioxide, silicate glasses, III-V semiconductors, II-VI semiconductors, II-IV semiconductors, transparent oxides, sol-gel glasses and spin-on glasses.

73. (New) The structure of Claim 70 further including a substrate for supporting the plurality of honeycomb layers and each intervening layer.

74. (New) The structure of Claim 70 wherein the thickness of each honeycomb layer is equal to one-quarter of the length of each rod.

75. (New) The structure of Claim 70 wherein each intervening layer has a thickness equal to twice the thickness of the honeycomb layers.

76. (New) A photonic or phononic lattice structure comprising a plurality of stacked hexagonal-pattern layers of interconnected rods separated by intervening interconnection layers having a triangular array of dots formed therein, with adjacent of the hexagonal-pattern layers being laterally displaced relative to each other along a diagonal, and with the dots connecting vertices of the interconnected rods of one hexagonal-pattern layer to the vertices of the interconnected rods of an adjacent hexagonal-pattern layer.

77. (New) The structure of Claim 76 wherein the interconnected rods and the dots comprise a first material.

78. (New) The structure of Claim 77 wherein a second material fills in spaces between the interconnected rods of each hexagonal-pattern layer and spaces between the dots of each interconnection layer.

79. (New) The structure of Claim 78 wherein the first and second materials are selected from the group consisting of polycrystalline silicon, amorphous silicon, silicon nitride, silicon dioxide, silicate glasses, III-V semiconductors, II-VI semiconductors, II-IV semiconductors, transparent oxides, sol-gel glasses, spin-on glasses, gases, air and vacuum.

80. (New) The structure of Claim 76 further comprising a substrate whereon the hexagonal-pattern layers and interconnection layers are supported.

81. (New) The structure of Claim 76 wherein the thickness of each hexagonal-pattern layer is equal to one-quarter of the length of each rod.